



#523

ISEE 3  
78-079A-15A  
GAMMA RAY BURST SPECTROMETER

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## **1. INTRODUCTION:**

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

## 2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

*When printing, special settings may be required to make the text box appear on the printed output.*

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC  
INFORMATION SYSTEM:

<http://nssdc.gsfc.nasa.gov/nmc/>

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

- a. Associated Documents      To find associated documents you will need to know the document ID number and then click here.  
<http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/>

- b. Core Catalog Materials

ISEE 3

GAMMA-RAY BURST SPECTROMETER DATA

78-079A-15A

ASGA-00013

This data set has been restored. There was originally one 9-track, 1600 BPI tape written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tape was created on a 360 computer and the restored tape was created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D number are as follows:

DR#	DS#	D#	FILES	TIME SPAN
-----	-----	-----	-----	-----
DR004809	DS004809	D047009	1 - 8	11/04/78 - 12/05/80

REQ. AGENT

DEW

REQ. NO.

V0114

ACQ. AGENT

HKH

ISEE-3

GAMMA-RAY BURST SPECTROMETER DATA

78-079A-15A

THIS DATA SET CATALOG CONSISTSO F 1 DATA TAPE. THE TAPE IS 1600 BPI WITH 8 FILES OF DATA WRITTEN IN EBCDIC, 9 TRACK, AND CREATED ON AN IBM 360 COMPUTER. THE D AND C NUMBERS WITH THE TIME SPAN FOLLOW:

<u>D#</u>	<u>C#</u>	<u>TIME SPAN</u>
D-47009	C-22001	11/04/78-12/05/80

TABLE I. ISEE-3 COSMIC EVENTS

# OF STORIES	DATE DD/MM/YY	DOY	APPROX TRIGGER TIME	DETECTOR*				FILENAME (NUMBER)
				N1 N2	FT1 FT2	TS1 TS2	TH1 TH2	
2	04/NOV/78	308	16:17:54	32 32	2048 4096	GE MEH	190 4095	GRB.DAT (1978)
2	19/NOV/78	323	09:26:58	32 32	4096 2048	MEH GE	4095 110	GRB.DAT (1978)
1	13/JAN/79	13	07:18:56	32 32	1024 1024	<del>HOH</del> GE	4095 110	GRB.DAT (1979)
2	05/MAR/79	64	15:52:05	64 32	1024 1024	HOH GE	4095 95	GRB.DAT (1979)
2	07/MAR/79	66	22:18:52	64 32	1024 1024	HOH GE	4095 95	GRB.DAT (1979)
1	15/MAR/79	74	18:52:15	64 32	1024 1024	<del>HOH</del> GE	4095 95	GRB.DAT (1979)
2	18/APR/79	108	07:41:09	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1979)
1	12/MAY/79	132	21:28:25	1 32	1024 1024	<del>MEH</del> GE	4095 95	GRB.DAT (1979)
2	13/FEB/80	44	07:29:12	128 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	22/MAR/80	82	07:21:59	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	17/APR/80	108	12:10:13	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	19/APR/80	110	01:19:44	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	02/JUN/80	154	13:20:23	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	23/JUL/80	205	13:47:28	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	06/AUG/80	219	22:03:31	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)
2	05/DEC/80	340	09:41:36	32 32	1024 1024	HOH GE	4095 95	GRB.DAT (1980)

\*GE = GERMANIUM DETECTOR

HOH = CSI CRYSTAL, IN HOVESTADT'S EXPERIMENT

MEH = CSI CRYSTAL, IN MEYER'S EXPERIMENT





F. CALIBRATION PROCEDURES: THE TIME BASE FOR RECORDING THE TIME HISTORIES IS GMT (GREENWICH MEAN TIME). TIME TAGS FOR RATES RECORDED ARE ACCURATE TO APPROXIMATELY ONE MILLISECOND (ABSOLUTE) IN PRINCIPLE. NOTE THAT A TIME INTERVAL FOR WHICH A RATE IS RECORDED IS INVERSELY PROPORTIONAL TO THE RATE. HENCE A HIGH RATE CORRESPONDS TO A SHORT TIME INTERVAL, (DURING WHICH N1(2) PHOTONS ARRIVED), AND THEREFORE THAT PORTION OF THE EVENT IS TIME REFERENCED WITH A HIGHER PRECISION.

F. DATA MEANINGFULNESS: THE EVENTS OF 15/MAR/79 AND 12/MAY/79 WERE NOT OBSERVED BY ANY OTHER SPACECRAFT. BOTH ARE OF SHORT DURATION (LESS THAN ONE SECOND). COINCIDENTLY, TIME GAPS IN DATA RECORDING EXIST FOR ONE DETECTOR AT THE TIME OF THE SHORT RATE INCREASE WHICH TRIGGERED THE OTHER DETECTOR. CONSEQUENTLY, IT IS NOT CERTAIN WHETHER THIS DATA REPRESENTS TRUE GAMMA-RAY EVENTS OR FALSE TRIGGERS DUE TO A HIGHLY CHARGED COSMIC RAY INCIDENT ON THE DETECTOR SIMULATING A SPIKELIKE EVENT. ALL OTHER TIME HISTORIES ARE OF EVENTS CONFIRMED BY AT LEAST ONE OTHER SPACECRAFT.

G. NO EVENTS ARE KNOWN TO HAVE OCCURRED DURING THE LIFE OF THE ISEE-3 SPACECRAFT WHICH MIGHT HAVE EFFECTED THE VIABILITY OF THE TIME HISTORY CAPABILITY.

H. & T. ANOMALIES: RECORDS WITH ZEROED TIME INTERVALS AND RATES INDICATE LOSS OF DATA (DURING TRANSMISSION OR OTHERWISE) FOR THAT INTERVAL. CHARACTERISTICALLY, A PERIOD FOR WHICH DATA IS LOST IS FOLLOWED BY A RECORD IN WHICH THE TIME INTERVAL IS SET TO -1.0 AND THE RATE TO ZERO; THIS SIGNIFIES A GAP IN THE DATA. THE PROGRAM WHICH REDUCES THE RAW DATA SEARCHES FORWARD IN TIME FOR A TIME REFERENCE TO USE FOR TAGGING RATES AFTER THE TIME LOSS. ONLY WHEN TWO DATA GAPS OCCUR WITH NO TIME TAG PLACED IN BETWEEN THEM IS THE TIME TAGGING INVALID. THIS SORT OF OCCURRENCE IS HIGHLY INFREQUENT.

J. K. & L. NO INFORMATION AVAILABLE TO BE GIVEN AT PRESENT.

## THE ISEE-C GAMMA-RAY BURST SPECTROMETER

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ABSTRACT

This paper describes the technical properties, operation and expected sensitivity of an experiment, to be launched on the ISEE-C spacecraft, that is intended to search for narrow lines in the spectra of gamma-ray bursts. At the heart of the experiment is a radiatively cooled Germanium solid state photon detector. The instrumentation is capable of storing the entire spectrum of all but the largest bursts in the energy range 0.05-6.5 MeV. In addition it analyzes the signals from two CsI detectors in two other experiments on the spacecraft and records event time histories from these to a few millisecond accuracy. A background mode permits spectral analysis during quiet times and will allow the determination of physically interesting upper limits for narrow lines in the diffuse gamma-ray background radiation.

Two types of gamma-ray lines are known to exist in two different types of transient events. The first of these, solar flares, have exhibited a large number of lines from the 0.511 MeV positron annihilation line to the 6.4 MeV  $^{60}\text{Co}$  line (Clayton et al., 1973). The study of these lines has provided valuable new insight into the physical conditions and processes at the flare site. The second type of transient is the mysterious 20 minute duration event observed by the IMP during the Johnson 1978) in the general direction of the high energy gamma-ray source in 1954. This paper will describe a detector system intended to search for narrow gamma-ray lines in a third type of transient event, the gamma-ray burst. The origin of these bursts remains a mystery and the discovery and identification of gamma-ray lines would provide a valuable new clue to the nature of the physical processes responsible for the burst.

Most of the instrumentation employed thus far in gamma-ray burst studies has had either a very limited spectral capability or none at all. The ISEE-C instrument uses a radiatively-cooled high purity Germanium detector to make precise measurements of the photon energy. It represents a major step forward in the capability for line detection in transient events.

## 2. Instrument Description

### A. The ISEE-C Mission

The ISEE (International Sun-Earth Explorer) Mission is a three-spacecraft series intended to study the spatial and temporal variations of the earth's magnetosphere as influenced by the sun and associated interplanetary conditions. The third spacecraft ISEE-C, to be launched in August 1978, will be in a halo orbit about the Lagrangian point along the earth-sun line 230 earth radii inward towards the sun. It will be spin-stabilized with its axis normal to the ecliptic plane. The spacecraft location and attitude make it an ideal platform for

our experiment from both an engineering and scientific point of view. From the point of view of thermal performance, the location is far from the earth so that earth-albedo is not a problem and the spin axis orientation allows for the optimum orientation of the cooler field-of-view. From a scientific point of view the location outside the earth's magnetosphere means that the serious effect of trapped radiation on the instrumental background is avoided.

Our ISEE-C instrument is an augmentation of gamma ray burst instrumentation developed by us for the ISEE-A mission. This instrumentation is part of the Hovestadt low-energy charged particle experiment. Figure 1 shows the ISEE-C spacecraft and the location of the cooler/sensor. Its recessed location within the lower body of the spacecraft prevents any direct sunlight from striking the cooler and is generally a favorable situation with regard to its thermal performance.

#### B. The Radiatively-Cooled Detector

A cross-sectional view of the Germanium detector mounted in its cooler is presented in Figure 2. Its basic structure is divided into two parts, an outer stage and an inner stage. The outer stage is designed to operate at an intermediate temperature ( $\sim 160^\circ\text{K}$ ) and thereby provide a thermal buffer between the sensor (residing in the inner stage) and the spacecraft. The outer stage has a basic conical shape to define a field of view ( $126^\circ$  full angle) for the inner stage. This field of view must not contain the sun, earth, or any significant portion of the spacecraft. The mechanical interface between the outer stage and the spacecraft is via a support ring, which is in good thermal contact with the spacecraft and will be maintained near room temperature. As the outer stage radiatively cools (via its radiating surface shown in Figure 1) it will contract slightly. The support points are designed such that this contraction causes a break in the thermal path between the support ring and

the outer stage, thereby thermally isolating it from the spacecraft. The inner conical surface of the outer stage is highly polished specular aluminum so that no sunlight can be scattered into the inner stage.

The Germanium crystal is housed in the inner stage of the cooler in a hermetically sealed Magnesium enclosure. The exposed surface is coated with a highly emissive white paint to allow efficient radiation of heat. The inner stage is mechanically supported in a similar fashion to the outer stage so that a second level of thermal isolation is attained. The predicted equilibrium operating temperature of the inner stage is  $100^{\circ}\text{K}$  ( $-173^{\circ}\text{C}$ ).

The Germanium crystal itself is 4cm diam. x 3cm depth ( $35\text{cm}^3$  active volume) and will have an energy resolution of 3-3.5 keV at 1 MeV. It is made from high purity Germanium. The use of this material permits the crystal to be stored indefinitely at room temperature without sustaining any loss in performance. The weight of the cooler/sensor/electronics package is 2.57 kg. Figure 3 is a photograph of the cooler/sensor.

#### C. Additional CsI Detectors

In addition to the Germanium detector there are two other detectors on board the spacecraft whose signals we analyze to give us increased sensitivity to gamma-ray bursts. These are CsI crystals located respectively in the Hovestadt and Meyer experiments on the ISEE-C spacecraft. The Hovestadt detector is a small cylindrical CsI crystal from which only time history (count rate) information is obtained. Both count rate and spectral analysis are performed on the Meyer crystal which is much larger and has the shape of a truncated cone. This crystal is also significantly larger than the Germanium crystal, and although it has much poorer resolution, it will provide a more accurate record of the time history of the event.

#### D. Electronics

A simplified block diagram of the electronics is shown in Figure 4. The Germanium detector signals are amplified and shaped in a charge-sensitive pre-amp and following post-amp. The signals are digitized by a 4096 channel ADC which is identical to one developed for the Caltech-Goddard cosmic ray experiment on the Voyager mission. It covers the energy range .05 to 6.5 MeV. Analysis is initiated when the signal exceeds a ground-programmable threshold which can be set in any of eight different positions between 56 and 440 keV. This same threshold circuit generates those signals that are used for time history analysis.

The CsI crystal located in the Meyer experiment is viewed by a small PMT whose signals are amplified and shaped and then digitized in a 512 channel ADC. A count rate signal and the 512 channel pulse train are both analyzed by our electronics. The smaller Hovestadt CsI crystal provides only a count rate, but is located on the opposite side of the spacecraft from Meyer so that a more complete coverage of the burst time history during the spacecraft rotation cycle can be obtained.

The digital portion of the electronics is physically housed in the Hovestadt experiment. The detection of a burst is accomplished by two independent trigger circuits. These circuits continuously sample the count rate and register a trigger if and when the rate exceeds a value selected by ground command. Any one of three sensors can be connected by ground command to each of the trigger circuits. More precisely, these circuits measure the time interval between the occurrence of N counts, where N is also selectable by ground command and can have any binary value between 1 and 128. Time is measured by counting a clock frequency whose value can also be selected from the ground.

Upon the occurrence of a trigger the burst data is then stored in a  $10^5$  bit memory. This memory is partitioned into three sections, two of which are devoted to recording the time history of the event. The same technique used to define a burst, i.e. storage of a time interval rather than a count rate, is used to record the event in the memory. Each partition contains 2048 12-bit words so that 2048 xN counts can be stored. It is very unlikely that any burst can exceed the storage capacity of the memory. The third memory partition is devoted to the storage of spectral information. Either the Germanium or the Meyer CsI crystal can be input by ground command into this part of the memory. This section of the memory is organized into 3072 16-bit words. Each word contains 12-bits of pulse height and a 4-bit time vernier tag. Again, the time resolution is selectable by command and will most likely be  $\sim 30$  msec.

After the memory is filled it is slowly read out into the spacecraft telemetry stream. There are two read-out modes 1) automatic, where read-out begins as soon as the memory is filled and 2) manual, where read-out is initiated by ground command.

During quiet times the instrument functions in what is called the Background Mode. In this mode a small fraction of the detected photons are analyzed and stored in a small (36 event) buffer memory. They are then read out in the spacecraft telemetry stream in the same manner as spectral data from a gamma-ray burst. This mode is intended to provide information on the detector calibration and background level. In addition it can potentially allow the determination of meaningful upper limits for narrow lines in the diffuse gamma-ray background.

### 3. Instrument Sensitivity

Since the gamma-ray burst is a relatively short-lived phenomenon the instrument narrow-line detection threshold will in general be statistics rather than background limited. The electronics is configured such that it can store a fixed maximum number of events. It is most useful to discuss the sensitivity in terms of the



fraction of the total photons in the burst that must appear in the line in order for the line to be detectable. Since over most of its range the background under a narrow line is negligible it is simply a question of how many counts in a narrow window are necessary to define a line. If we rather arbitrarily set this threshold at 5 counts this requires that, for a narrow line at 0.5 MeV, 1-2% of the total photons in the burst must appear in this line. For a typical burst duration of 30 seconds the incident line flux is  $5.3 \times 10^{-2} \text{ cm}^{-2} \text{ sec}^{-1}$ .

The detector also has the capability of placing meaningful upper limits on the narrow line flux of photons in the diffuse background spectrum. Because of the extremely low bit rate allocated for gamma-ray burst studies ( $\sim 1.5$  bits/sec), the instrument can analyze only a small fraction of the total number of photons detected. However, the long anticipated life-time ( $\geq 2$  yr.) of the ISEE-C mission will compensate for this. Assuming a 2 year accumulation time the  $3\sigma$  upper limit for narrow line detection in the background mode is plotted in Figure 5 as a function of energy. The range of values is  $\sim 2.5 \times 10^{-4} \text{ cm}^{-2} \text{ sec}^{-1}$ . These threshold values are low enough to afford the possibility of determining physically interesting upper limits for narrow lines in the diffuse background.

#### Acknowledgements

We are deeply indebted to Mr. John McElroy, Head, Instrument Electro-Optics Branch for making the radiative cooler available to us and allowing us to modify it for use on the ISEE-C mission. Messrs. M. Beazley, H. Costlow, G. Serbu, and C. Thomas carried out most of the assembly and test of the instrumentation.

## REFERENCES

- Chupp, E. L., Forrest, D. J., Higbie, P. R., Suri, A. N., Tsai, C., and  
Dumphy, P. P. 1973, *Nature*, 241, 333.
- Jacobson, A. S., et al. this Volume, p. 228.

## FIGURE CAPTIONS

1. ISEE-C spacecraft. Mounting location of radiative cooler is shown as well as exploded view of cooler.
2. Cross-sectional view of Radiative Cooler and Germanium Detector.
3. Photograph of Radioactive Cooler
4. Simplified Block diagram of electronics.
5. Sensitivity for narrow line detection in the Diffuse Background Radiation.  $3\sigma$  threshold isotropic intensity is plotted as a function of incident energy.

# ISEE-C RADIATIVELY COOLED GERMANIUM GAMMA-RAY BURST DETECTOR

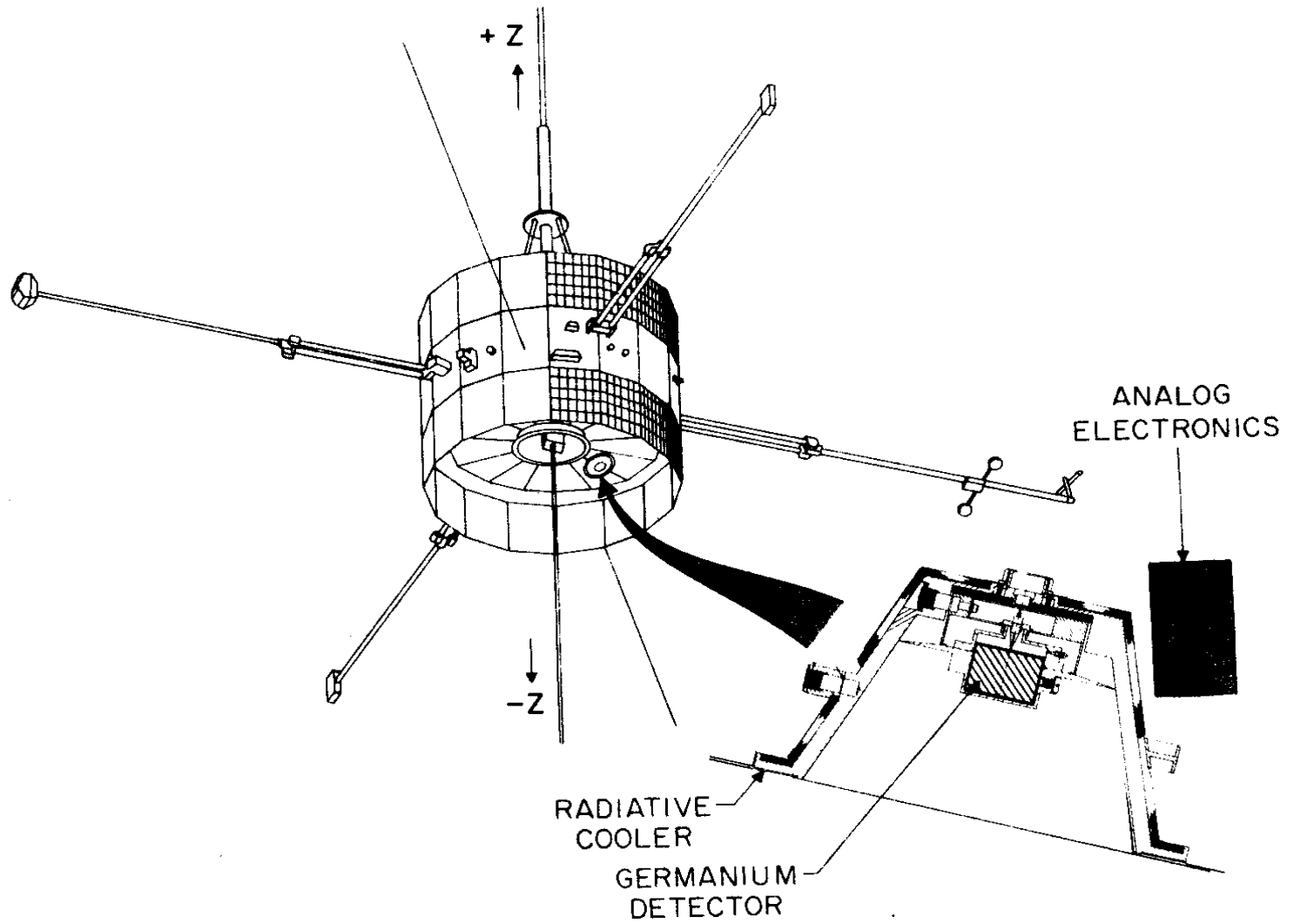
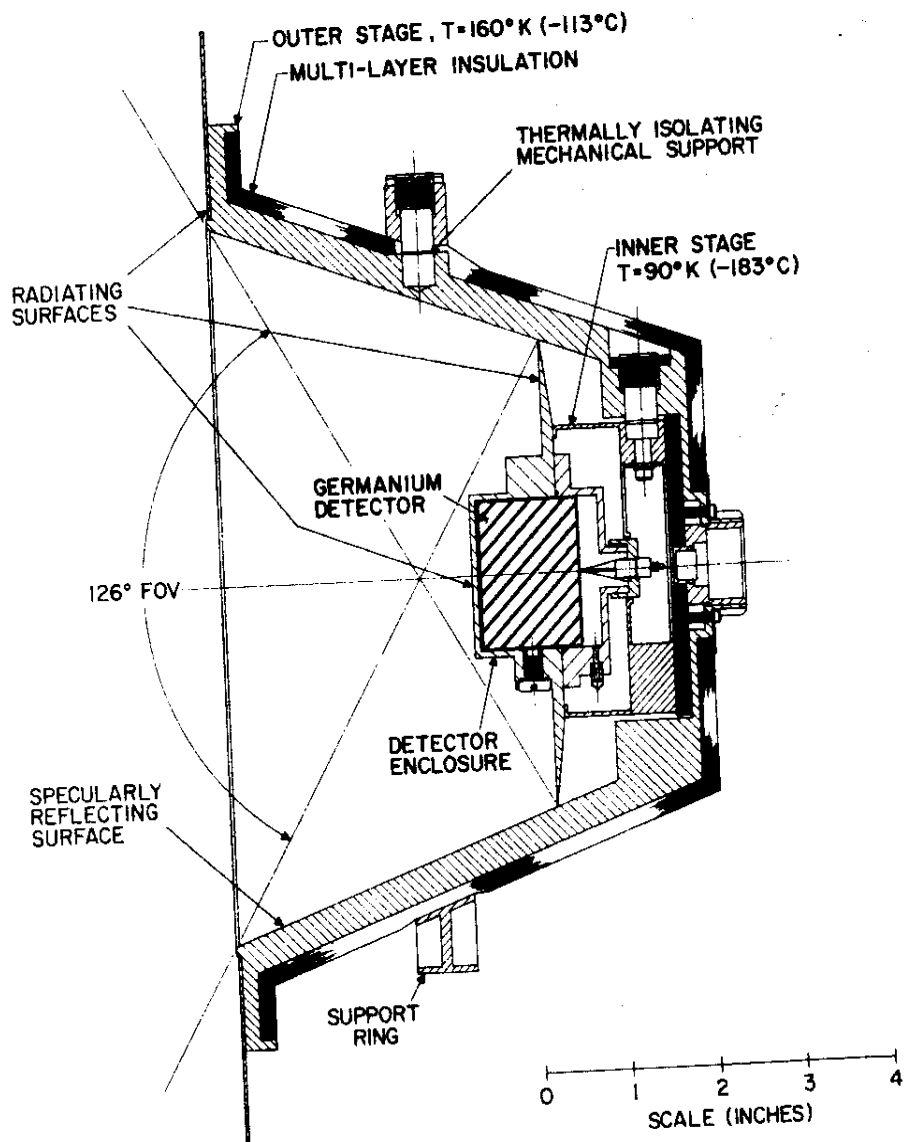


Figure 1



ATD - RADIATIVELY COOLED  
GERMANIUM DETECTOR FOR  
ISEE-C

Figure 2

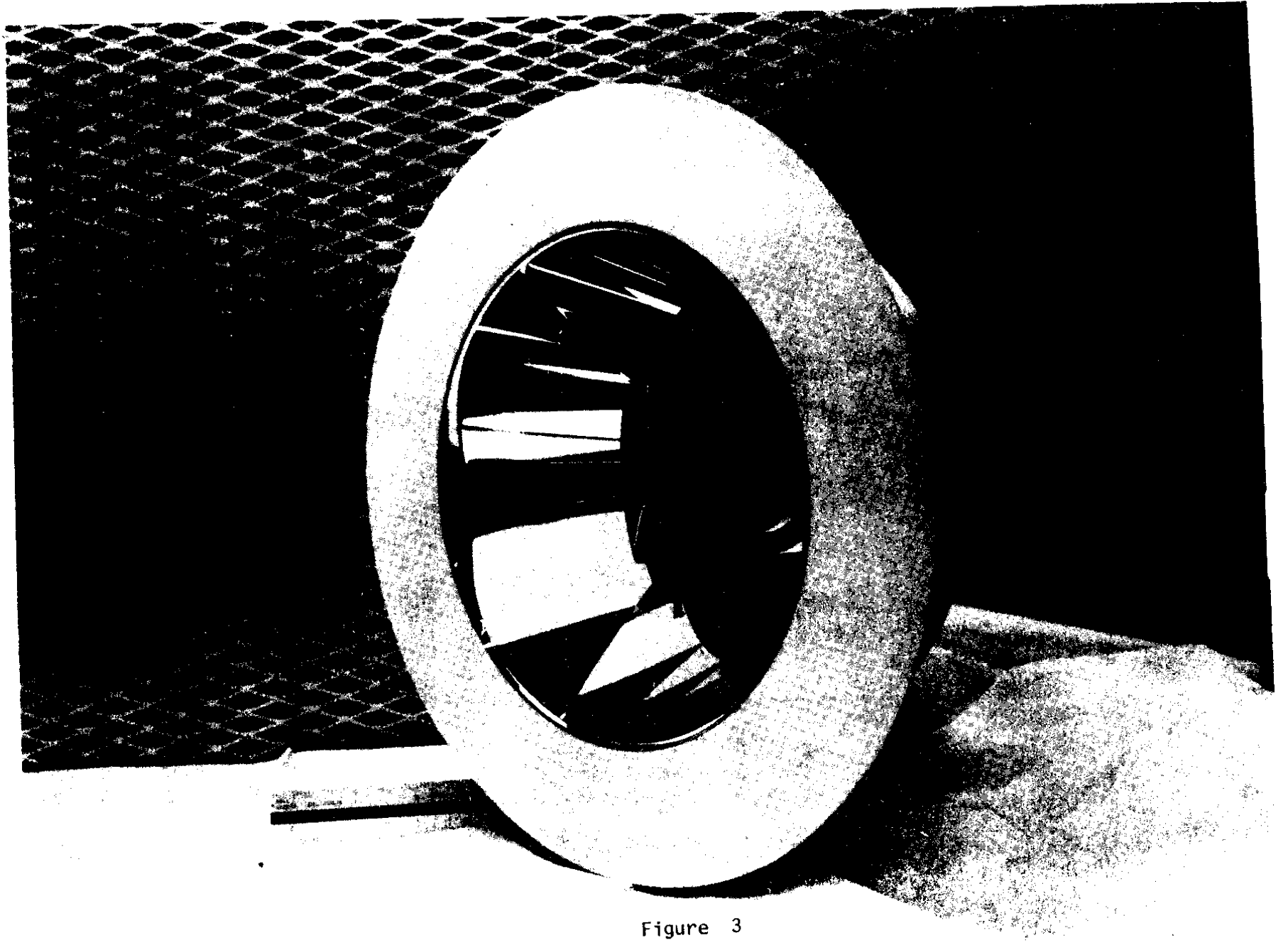
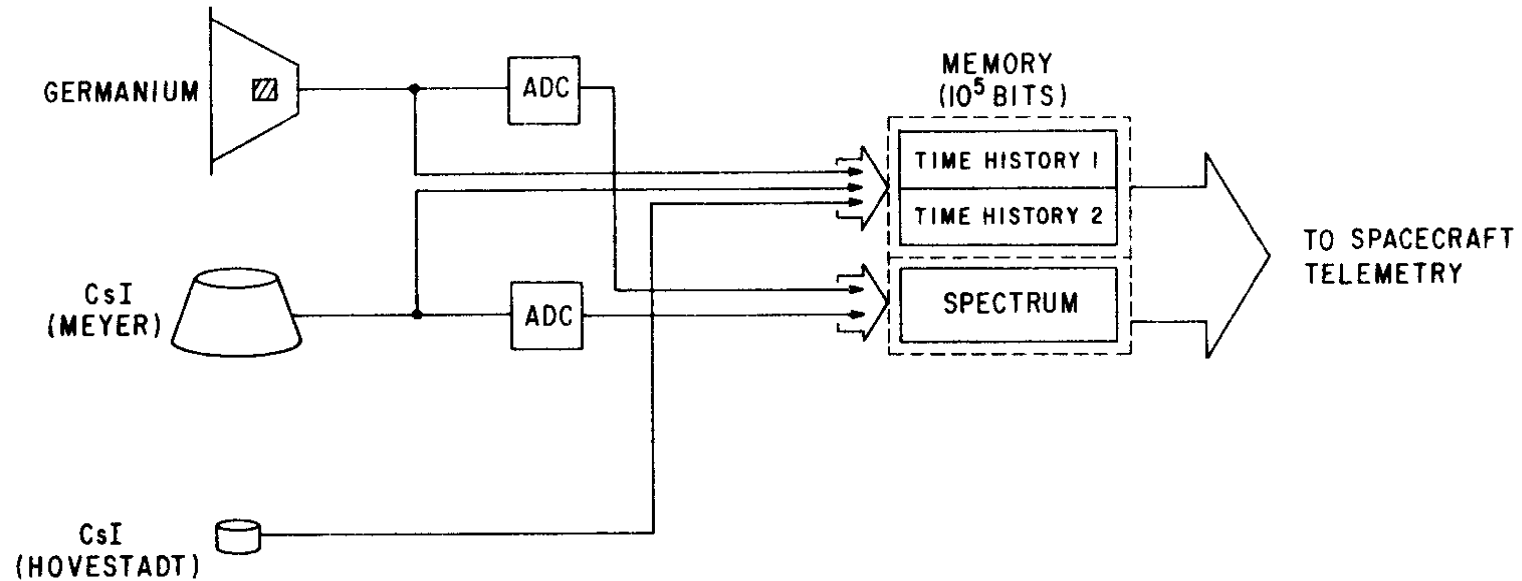


Figure 3

## SIMPLIFIED BLOCK DIAGRAM OF ISEE-C GAMMA RAY BURST INSTRUMENTATION



### TIME HISTORY

TIME HISTORIES ARE STORED VALUES OF ELAPSED TIME FOR THE OCCURRENCE OF A FIXED NUMBER N COUNTS.

MEMORY CAPACITY IS 2048 x N DETECTOR COUNTS.

ANY OF THE THREE SENSORS CAN BE CONNECTED BY GROUND COMMAND TO EITHER OF THE TWO TIME HISTORY MEMORIES.

### SPECTRUM

INDIVIDUAL 12 BIT PULSE HEIGHTS + TIME TAGS ARE STORED IN SPECTRUM MEMORY. MEMORY CAPACITY IS 3000 EVENTS.

EITHER THE GERMANIUM OR THE MEYER CsI CAN BE CONNECTED BY GROUND COMMAND TO THE SPECTRUM.

Figure 4

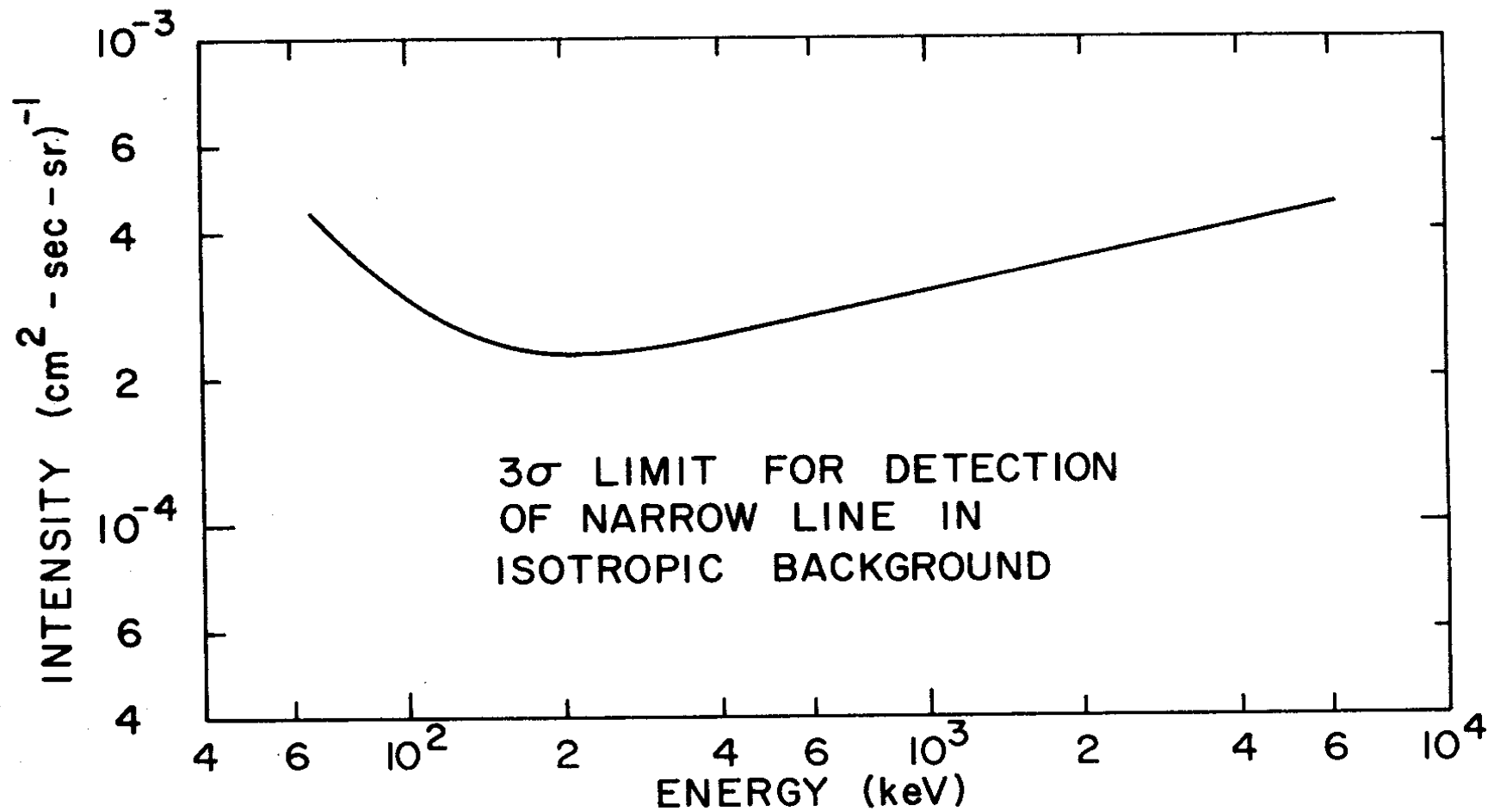


Figure 5







( 30880)	40404040	F8F040F3	F4F04040	F940F4F3	40F4F94B	F3F8F740	40404040	40F6F34B	F0F1F5F4	40F04BF5
( 30920)	F0F7F840	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 30960)	40404040	F8F040F3	F4F04040	F940F4F3	40F4F94B	F8F9F540	40404040	40F4F94B	F6F4F8F5	40F04BF6
( 31000)	F4F4F540	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31040)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F04B	F5F3F940	40404040	40F6F14B	F2F4F8F6	40F04BF5
( 31080)	F2F2F540	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31120)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F14B	F0F6F240	40404040	40F4F44B	F9F4F9F2	40F04BF7
( 31160)	F1F1F940	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31200)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F14B	F7F7F440	40404040	40F4F44B	F9F4F9F2	40F04BF7
( 31240)	F1F1F940	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31280)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F24B	F4F8F640	40404040	40F6F14B	F7F1F0F0	40F04BF5
( 31320)	F1F8F640	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31360)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F34B	F0F0F540	40404040	F1F0F14B	F7F6F4F0	40F04BF3
( 31400)	F1F4F540	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31440)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F34B	F3F1F940	40404040	40F5F84B	F9F3F5F2	40F04BF5
( 31480)	F4F3F040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31520)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F34B	F8F6F240	40404040	40F7F24B	F3F3F5F5	40F04BF4
( 31560)	F4F2F440	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31600)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F44B	F3F0F540	40404040	40F5F04B	F4F1F2F3	40F04BF6
( 31640)	F3F4F840	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31680)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F44B	F9F4F040	40404040	40F6F24B	F7F7F3F9	40F04BF5
( 31720)	F0F9F840	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31760)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F54B	F4F4F940	40404040	40F6F54B	F0F1F5F9	40F04BF4
( 31800)	F9F2F240	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31840)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F54B	F9F3F940	40404040	40F4F24B	F5F5F5F8	40F04BF7
( 31880)	F5F2F040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040
( 31920)	40404040	F8F040F3	F4F04040	F940F4F3	40F5F64B	F6F9F140	40404040	40F4F54B	F0F7F2F9	40F04BF7
( 31960)	F1F0F040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040

FILE	8	RECORD	8	C	7	3	LENGTH	720	BYTES											
( 0)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F34B	F4F1F940	40404040	40F4F84B	F6F8F9F4	40F04BF6										
( 40)	F5F7F240	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 80)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F44B	F0F7F740	40404040	40F5F14B	F5F2F2F0	40F04BF6										
( 120)	F2F1F140	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 160)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F44B	F6F9F840	40404040	40F5F74B	F1F8F6F7	40F04BF5										
( 200)	F5F9F640	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 240)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F54B	F2F5F840	40404040	40F4F34B	F9F8F3F9	40F04BF7										
( 280)	F2F7F540	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 320)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F54B	F9F8F640	40404040	40F5F84B	F8F2F9F4	40F04BF5										
( 360)	F4F3F940	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 400)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F64B	F5F3F040	40404040	40F4F54B	F1F3F5F0	40F04BF7										
( 440)	F0F9F040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 480)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F74B	F2F3F940	40404040	40F6F64B	F1F9F8F0	40F04BF4										
( 520)	F8F3F440	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 560)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F74B	F7F2F340	40404040	40F3F64B	F1F6F7F8	40F04BF8										
( 600)	F8F4F840	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										
( 640)	40404040	F8F040F3	F4F04040	F940F1F9	40F5F84B	F6F0F840	40404040	40F4F84B	F0F4F6F9	40F04BF6										
( 680)	F6F6F040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040	40404040										

FILE	INPUT	DATA RECORDS	MAX.	READ ERROR SUMMARY				INPUT RETRIES		
	RECS.	INPUT	SIZE	PERM	ZERO	B	SHORT	UNDEF.	#RECS.	TOTAL#
8	7	8	32000	0	0	0	0	0	0	0

EOJ DUMP STOPPED AFTER FILE 8 # OF PERMANENT READ ERRORS 0

START TIME 12/19/81 16:08:58 STOP TIME 12/19/81 16:09:39